CHAPTER II

POTENTIAL GAINS FROM MILESTONE BUDGETING

If effectively carried out, milestone budgeting could introduce major improvements in the way the nation acquires weapons systems for its defense. Some advantages are general in nature. Milestone budgets could alter the incentives provided to defense program managers, causing them to focus more on program implementation rather than budget review. This approach could also garner some of the overall benefits of multiyear budgeting. Other advantages are more specific. Milestone budgeting could reduce the instability now associated with defense programs--a problem cited by many major reviews of defense procurement undertaken during the last 15 years. In turn, increased stability could lower costs. Finally, milestone budgeting could reduce the budgetary workload in the Administration and the Congress.

OVERALL ADVANTAGES

Today's managers of weapons programs must pay considerable attention to each year's funding requests. Under the current system, that attention is well-placed. As the next section of this chapter makes clear, those requests are frequently altered within both the Administration and the Congress. Nonetheless, time spent revising annual funding requests takes away from time spent ensuring that defense dollars are spent wisely. Milestone budgeting would free defense managers to concentrate more on implementing plans. Likewise, milestone budgeting should reduce the time companies with defense contracts spend supporting annual budget requests, which could lower the cost of weapons.

More generally, milestone budgeting would garner for parts of the defense budget the advantages inherent in multiyear budgeting. It is very difficult to alter in one year the course of a major government program--whether that program provides medical care or builds weapons. Commitments have been made and designs are in place that take time to change. Thus, to set priorities and spend efficiently for defense and other government activities, the Administration and the Congress need to plan ahead for more than one year. Milestone budgeting would provide one

means for such advance budgeting. 1/ The remainder of this chapter discusses more specific advantages of using the milestone approach for weapons acquisition.

PROGRAM STABILITY

The key to successful reform in funding weapons acquisition programs lies in improving program stability. Many major reviews of defense acquisition over the past 15 years have identified program instability as a major problem. 2/ According to these studies, program instability has often resulted in reduced military capability and higher costs for weapon systems. Despite the findings of these reports, little analysis has been done to characterize and quantify program instability. The following analysis provides aggregate level measures of the incidence and genesis of program instability and suggests that milestone budgeting could afford greater program stability than currently exists.

Not all changes to weapons programs are bad. Some are needed because of technical obstacles or changes in the threat; others may delay a new program to avoid closing key production facilities for existing programs. Many changes, however, are not related to valid military requirements, including those caused by overly optimistic forecasts of cost, performance, or schedule and those caused by budgetary constraints. Thus, it is important to identify not only the frequency of program changes but also their cause. The following analysis includes both the research and development (R&D) and production phases of weapons acquisition.

Frequency of Changes

An analysis of budget data from fiscal years 1982 through 1986 shows that changes to weapons research and development programs are pervasive within the annual budget process. This analysis defines a "major change" for R&D programs as shifts in funding by greater than ten percent from the DoD planned level or from the level requested in the President's budget to the level approved by the Congress.

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1. For a discussion of advance budgeting, see Congressional Budget Office, *Advance Budgeting: A Report to the Congress* (February 1977).

2. These studies include Report of the Commission on Government Procurement (1972); Defense Resource Management Study Final Report (1979); Carlucci Initiatives (1981); Grace Commission (1984); and Packard Commission (1987).

TABLE 1. NUMBER OF MAJOR CHANGES IN RESEARCH AND DEVELOPMENT PROGRAMS, FISCAL YEARS 1982-1986

	Total Possible Changes	Total Number of Adjustments Greater than 10 Percent	Percent Adjusted
Changes from DoD Planned Budget to President's Budget (Budget Year +1)	2,466	1,900	77.0
Changes from President's Budget to Congress-Approved Budget	2,466	1,523	61.8
Changes from DoD Planned Budget to Congress-Approved Budget (Budget Year +1)	2,446	2,039	83.4

SOURCE: Department of Defense, *R-1*, 1981-1987.

Table 1 shows that, in the year between the time that DoD approved advanced plans for a particular budget and the time that the Congress approved that budget, 2,039 out of the 2,446 possible changes in R&D programs examined--or an average of 83.4 percent--experienced changes of greater than 10 percent in their funding over the 1982-1986 period. 3/ Of the 2,039 cases, 770 cases (37.8 percent) were adjusted to increase funding above the approved plan; 1,269 cases (62.2 percent) experienced reduced funding. Some of the reductions may have been caused by the lower than anticipated inflation during this period, but such decreases generally amounted only to a few percent.

While it is reasonable to attribute unstable funding for R&D programs to the many uncertainties encountered during the early stages of the acquisition process, it is less evident that production programs would experience

3. Data shown here include all weapons programs in advanced and full-scale development. Results reflect changes during the year between approval of an advanced plan (for example, the 1986 column of the 1985 budget) and actual approval of the budget (in this example, Congressional approval of the 1986 budget).

a similar degree of instability. Data indicate, however, that major changes for production programs occur nearly as frequently as for development programs. For production programs, "major changes" are defined as changes of more than 5 percent in the quantity of items procured from the DoD plan to the budget approved by the Congress. Table 2 indicates that, during the 1982-1986 period, major changes in production quantities occurred an average of 66 percent of the time. The incidence of major changes in recent years varied from 71.4 percent in 1984 to 60 percent in 1985 to 65 percent in 1986.

Both DoD and the Congress have introduced a significant degree of funding instability for production programs in the budget process. As indicated in Table 2, from 1982 through 1986, DoD adjusted production quantities from planned levels by more than five percent for 268 out of 443 cases, or 60.5 percent. During the same period, the Congress changed production quantities from the President's budget request by more than five percent for 192 out of 529 cases, or 36.3 percent.

TABLE 2. NUMBER OF MAJOR CHANGES IN WEAPONS PRODUCTION PROGRAMS, FISCAL YEARS 1982-1986

	Total Possible Changes	Total Number of Adjustments Greater than 10 Percent	Percent Adjusted
Changes from DoD Planned Quantity to President's Budget (Budget Year +1)	443	268	60.5
Changes from President's Budget Quality to Congress-Approved Quantity	529	192	36.3
Changes from DoD Planned Quantity to Congress-Approved Quantity (Budget Year +1)	341	225	66.0

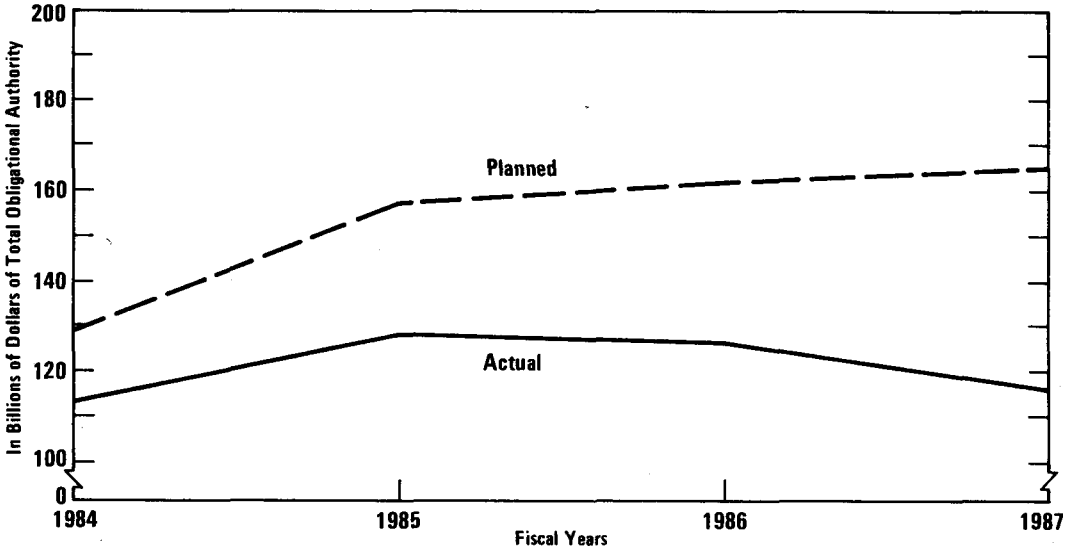
SOURCE: Congressional Research Service, *Selected Defense Procurement Acquisition Profiles: A Data Base* (June, 1986).

Causes of Major Changes

Congressional and DoD budget documents do not provide comprehensive information concerning specific causes of individual program adjustments. Consequently, a more indirect assessment is necessary. Budget reductions are one likely cause. Figure 1 compares total planned acquisition expenditures with funding authorized by the Congress from fiscal years 1984 through 1987. The "planned" line represents budget levels planned each year by DoD for the following budget year. The "actual" line indicates the budget authority approved by the Congress for the year corresponding to the plan.

For both R&D and production programs, actual budget authority was lower than planned levels over the 1984-1987 period. The disparity between planned versus actual was greater for production than for R&D. The Congress authorized $114.1 billion less for procurement (24.3 percent) and $14.9 billion less for R&D (10.5 percent) than DoD planned during this period. Clearly, these budget cuts led to program instability.

Figure 1.
DoD Weapons Acquisition Budget
(Planned Versus Actual)



SOURCE: Department of Defense, *R-1 and P-1*, 1983-1987.

An alternative means of assessing the causes of program instability is provided by the *Selected Acquisition Reports* (SARs) to the Congress. 4/ According to the September 1986 SARs, which reviewed 100 major weapons programs, quantity changes from the DoD plan produced the greatest proportion of cost increases above program baselines--about 63 percent. A variety of causes may have generated such changes, including those in program requirements as well as lower production rates resulting from budgetary constraints.

The SARs also identify the cost of technical (engineering) changes to programs that were needed to meet program performance objectives. According to the September 1986 SARs, only 16.6 percent of the cost increases above program baselines were explained by engineering changes. The SAR data suggest that unanticipated costs of purely technical changes have been greatly exceeded by nontechnical adjustments to program quantities.

Can Milestone Budgeting Reduce Instability?

It seems likely that milestone budgeting would result in fewer program changes. Since milestone budgeting would constitute a form of multiyear funding, the stable performance of multiyear production programs provides evidence of the potential effectiveness of a milestone budgeting approach. Of the 46 multiyear contract programs approved by the Congress since 1982, only one has been cancelled because of a change in requirements (M-60 Thermal Sight) and one contract was not awarded (M-9 Armored Combat Earthmover). Moreover, over the entire period of each multiyear contract, planned quantities have been approved for all multiyear programs except for minor adjustments to the C-2 aircraft and MK 45 gun mount contracts.

The relative stability of multiyear contract programs does not guarantee equal success for milestone programs. First, multiyear contracts are limited to weapons production programs and constitute only about 6.4 percent (in total obligational authority) of all defense procurement in 1987. Second, multiyear programs must fulfill special legal requirements for stable design, funding, and military need that not all production programs may be able to meet. Nonetheless, the success of multiyear contracting is

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4. In the SARs, DoD analyzes changes to program costs from baseline estimates. A variety of factors account for the changes, including those related to adjustments to quantities, schedules, and engineering. The SARs also estimate changes in cost stemming from economic factors, including inflation and estimating as well as changes to support requirements or related to management.

an encouraging indicator that greater stability is achievable through a multiyear budgeting approach.

The key to reducing instability lies in implementing management policies that are subsumed under a milestone budgeting approach. One such policy is program "baselining," an initiative recommended by the Packard Commission and incorporated into the 1987 Defense Authorization Act. A program baseline consists of a set of thresholds for requirements, costs, schedules, and performance that are established at an acquisition milestone. Under milestone budgeting, multiyear funding would be based on program baseline estimates, and could not be adjusted during a milestone period unless baseline thresholds were breached and revised baselines were approved.

The incentives underlying such an approach favor establishing more conservative program objectives--a consistent goal among those seeking greater program stability and more realistic budgets. Overly optimistic program estimates have contributed to program instability in the past since, in many cases, they were never achievable. The current law requires any deviation from a program baseline to be reported and a program review to be conducted by DoD to determine appropriate management actions. A conservative baseline estimate, therefore, would minimize the risk that such actions would be needed. The incentive toward more conservative program thresholds would be increased by tying multiyear funding to baseline estimates and by requiring a program review by the Congress in the event that a baseline threshold was breached.

Milestone budgeting would also create an incentive to avoid program changes that cause departures from baseline estimates. The requirement to report deviations from a program baseline, for example, would serve as an important incentive to maintain the program baseline if at all possible. Related policies, such as that adopted by the Air Force which requires a consensus among upper management before a major program change can be approved, reinforce a more conservative approach toward approving proposals for program changes.

SAVINGS

Milestone budgeting could achieve significant savings by improving program stability. Because milestone budgeting would constitute a major departure from the traditional budget process, no firm data exist with which to estimate the value of its potential benefits with confidence. Certain data, however, suggest possible savings.

TABLE 3. ESTIMATED ADDITIONAL COSTS OF WEAPONS SYSTEMS RESULTING FROM PROGRAM STRETCHOUTS

Source	Number of Program Stretchouts	Total Program Cost Increase (In millions of dollars of budget authority)
1981 SAR	22	3,939
1982 SAR	20	5,615
1983 SAR	17	2,402
1984 SAR	40	3,957
Total	99	15,913
Average per Year	25	3,978

SOURCE: Congressional Budget Office, based on Department of Defense, *Selected Acquisition Reports* (various years).

Savings generated through multiyear contracting represent one such measure. Based on a review of the 40 multiyear contracts approved from 1982 through 1986, DoD data suggest savings averaging 11.7 percent from the costs of procuring the same items on an annual basis. 5/ Most of these savings have been achieved through "economic order quantity" (EOQ) purchasing, a contracting technique that saves money through purchasing large lots. Milestone budgeting could achieve similar savings if EOQ purchasing were used and milestone programs remained stable.

Another possible measure of potential savings under milestone budgeting is the costs that could be avoided by refraining from slowing or stretching out programs. Such savings could be significant. The CBO, for example, has estimated that from 1981 through 1984 an average of $4 billion in budget authority was added each year to total program costs for stretched-out production programs (see Table 3). These estimated additional costs assume the purchase of the same total number of weapons, but at reduced production rates over a longer period of time.

5. Congressional Budget Office, *Alternative Strategies for Increasing Multiyear Procurement*, (July 1986), p. 17.

These aggregate estimates of stretch-out costs are borne out by estimates for individual weapons. The CBO examined a number of major programs that were stretched out from planned production levels during the 1983-1987 period. As a result of stretchouts, production unit cost increases among the sample programs varied from 2.6 percent for the Stinger missile to 48.2 percent for the Patriot missile. Moreover, stretchouts also resulted in reduced military capability since fewer systems were purchased. Some examples of the costs of stretching out a program are illustrated in Table 4.

TABLE 4. COSTS OF PRODUCTION STRETCHOUTS, FISCAL YEARS 1983-1987

System	Total 1983-1987 Quantity	Total 1983-1987 Cost (In millions of fiscal year 1983 dollars)	Procurement Unit Cost (In millions of fiscal year 1982 dollars)
F/A 18			
Planned	552	11,772.0	21.3
Actual	420	10,367.8	24.7
SH-60B			
Planned	186	2,828.3	15.2
Actual	107	1,834.5	17.1
Sparrow			
Planned	13,705	1,690.7	0.12
Actual	10,099	1,539.8	0.15
Patriot			
Planned	3,742	4,064.9	1.09
Actual	2,427	3,906.7	1.61
F-15			
Planned	390	10,204.0	26.2
Actual	207	7,124.4	34.4

SOURCE: Congressional Budget Office.

BUDGET REVIEW WORKLOAD

In addition to achieving cost savings and improved program management, milestone budgeting could potentially reduce the budget review workload below current levels for both the Congress and the DoD. In the short run, the workload could actually increase, since the Congress and DoD might spend more time assembling and assessing budgets for milestone programs in addition to conducting the normal annual budget review for other programs. The following analysis suggests, however, that milestone budgeting could ultimately reduce the number of systems subject to review each year.

Table 5 uses data from the December 1985 SARs to suggest the reductions in the number of programs subject to review under various milestone

TABLE 5. CONGRESSIONAL WORKLOAD FOR R&D AND PRODUCTION PHASES, UNDER TWO MILESTONE BUDGETING OPTIONS (By fiscal year)

Option	Program Reviews in 1986	Percent of Baseline in 1986	Program Reviews in 1976-1987	Percent of Baseline in 1976-1987
	Research and Development Phase			
Number in Baseline (Actual)	65	100.0	483	100.0
Two-Year Option	39	60.0	260	53.8
Five-Year Option	17	26.2	127	26.3
	Production Phase			
Number in Baseline (Actual)	62	100.0	382	100.0
Two-Year Option	38	61.3	206	53.9
Five-Year Option	13	21.0	103	27.0

SOURCE: Congressional Budget Office, based on Department of Defense, *Selected Acquisition Reports* (December 1985).

budgeting options. The baseline figures give the total number of budget reviews for individual SAR programs conducted in 1986 and during the period from 1976 through 1987. Program reviews for a two-year milestone budgeting option--that is, based on actual milestone occurrences and milestone funding for two-year increments thereafter--would have occurred about half as often as the baseline number of annual reviews. Figures for a five-year option--that is funding for five years or the full time required to reach the next milestones, whichever comes first--show roughly a 75 percent reduction in the number of reviews that would have occurred. Workload reduction estimates are similar for both research and development and production programs. Both assume no revisiting of programs that have received milestone budget status.

In theory, if the budget review focused on fewer programs each year, the quality of individual program reviews could improve. The opportunity would exist to examine programs in greater depth on milestone review occasions or when a baseline threshold was breached. On the other hand, the potential would also exist for unnecessary adjustments to the technical details of a program. Such intrusiveness could be an obstacle to the success of milestone budgeting if it generated additional program instability.

The potential for workload reduction could be significantly affected if milestone funding were authorized but not appropriated by the Congress. Under the current DoD interpretation of the milestone budgeting test mandated by the 1987 Defense Authorization Act, workload reduction would occur only with respect to the authorization process. Preparation and review of program budgets will still be required on an annual basis for the appropriation phase of the budget process.

CHAPTER III

POTENTIAL PROBLEMS UNDER MILESTONE BUDGETING

Along with important advantages, milestone budgeting could present some potential problems. If milestone budgeting worked as intended, portions of the budget would be exempt from review and adjustment each year; this inflexibility could be troublesome if the deficit or other constraints forced reductions in the defense budget. In these circumstances, cuts would have to be levied disproportionately on nonmilestone programs since the Congress would have already committed funding to milestone programs.

Milestone authorizations or appropriations for major weapon systems could also, under some approaches, introduce major year-to-year variations in defense budget authority. This variability could be a problem in overall reviews of defense budgets, which often focus on real growth from year to year. Both these problems, however, could be minimized by careful management of a milestone budgeting system.

BUDGET INFLEXIBILITY

Under milestone budgeting, portions of the defense budget would automatically be allocated each year to systems that did not have a milestone or were not scheduled to be reviewed by the Congress during that year. If the portions of the defense budget exempt from review were large and substantial budget reductions were required, these exemptions could result in disproportionate reductions in nonmilestone programs or in those milestone programs subject to review in that particular year.

Theoretically, of course, programs under milestone budgeting could still be altered by the Congress, even if they were between milestones, since the Congress could always pass a law changing previous decisions. Even signed contracts could be abrogated, though perhaps at substantial cost. If, however, the Congress adhered to the milestone approach, it would not alter past decisions, and, therefore, budget inflexibility could be a problem--perhaps an important one if recent history is a guide. Even in recent years when the defense budget was increasing, Congressional and DoD personnel have expressed concern that budget stabilizing measures would unnecessarily restrict their freedom to make program and budgetary adjustments. The

reticence of DoD to expand the use of multiyear contracts and of the Congress to fund a number of multiyear candidates reflects their mutual concern over losing budget flexibility.

Degree of Inflexibility

The extent of inflexibility would depend on how many programs were subject to milestone budgeting; the broader its scope, the greater the potential problem. The potential loss of flexibility would also depend on whether milestone budgeting applied only to authorizations, which would allow a program to go forward but provide no funding, or to both the authorizations and appropriations of funds.

Based on major programs in the December 1985 *Selected Acquisition Reports* (SARs) and assuming both authorizations and appropriations of milestone budgets, Figure 2 shows the percentage of research and development funding that would have been exempt from review during the 1976-1987 period under two milestone budgeting alternatives: one with reviews every two years and one with five-year reviews. 1/ The level of funding exempt from review would have increased over time as more programs entered the milestone budgeting system, which suggests the effects of phasing in milestone budgeting. Under the five-year scheme, for example, the portions of the R&D budget exempt from review would have increased from 4 percent in 1977 to about 23 percent in 1984 and then have declined slightly to about 18 percent in 1987 as the R&D phases of some programs were completed.

Stated in another way, while milestone budgeting for development programs would, under these assumptions, have resulted in an increasing loss of overall budget flexibility, it would still have permitted considerable leeway to make adjustments within the R&D appropriation. Even under the most restrictive case of the five-year option, milestone budgeting would have permitted the review of 77 percent of the R&D budget.

Similar trends for production programs are illustrated in Figure 3, although the absolute levels of exemption are much higher than for develop-

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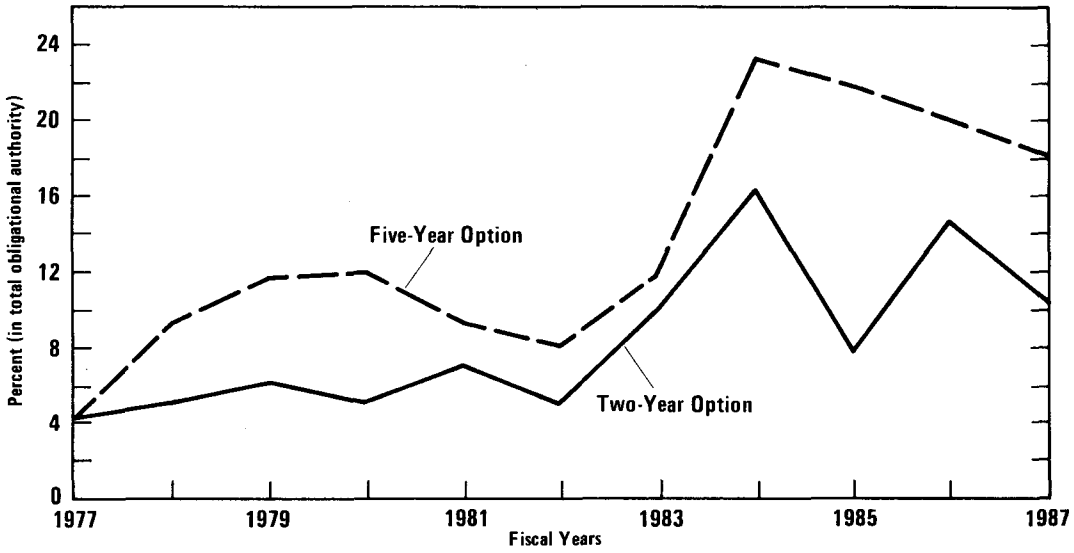
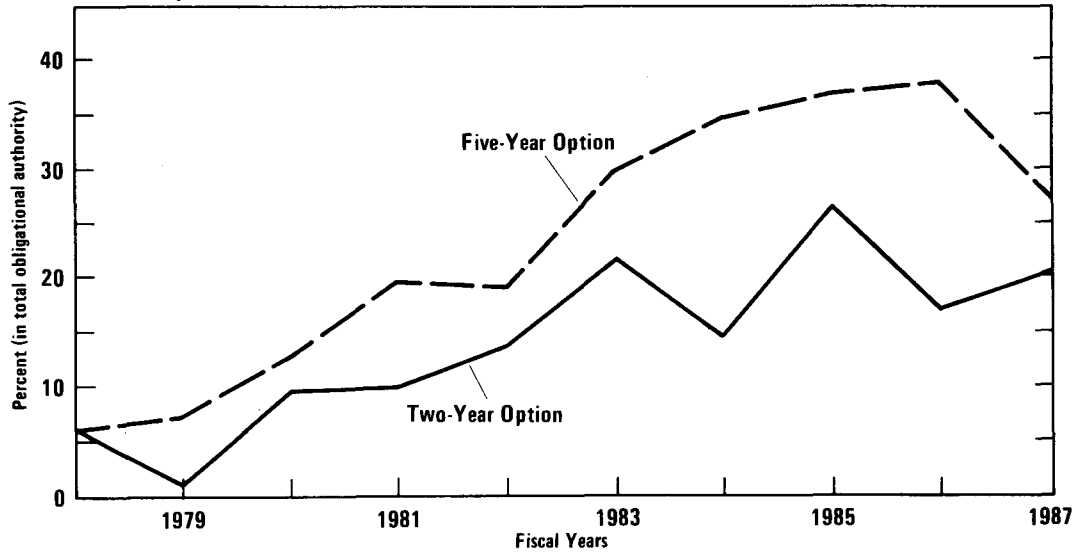
1. The two approaches to milestone budgeting are applied to SAR programs for full-scale development (FSD) and production milestones to determine the loss of budget flexibility that could have occurred during the 1976-1986 period. Major programs were assumed to be funded annually until their actual FSD and production milestones occurred; they were budgeted only on a milestone basis thereafter. Major programs not included in the December 1985 SAR and nonmajor programs were assumed to be reviewed annually.

Figure 2.
Percent of R&D Budget Exempt from Review Under Two Milestone Options



SOURCE: Department of Defense, *Selected Acquisition Reports* (December 1985).

Figure 3.
Percent of DoD Production Budget Exempt from Review Under Two Milestone Options



SOURCE: Department of Defense, *Selected Acquisition Reports* (December 1985).

ment programs. The maximum level of funding exempt from review would have varied from 26 percent for the two-year option in 1985 to 38 percent for the five-year option in 1986. This most restrictive case would still have permitted the review of 62 percent of the production budget.

The analysis is based on historical program behavior and budget data, and makes no allowance for the possibility that individual programs and the overall budget might have been managed differently under a milestone system. There is no reliable way to predict the changes that might have occurred under a milestone budgeting system and to adjust the results of the analysis accordingly. Despite this important limitation, the results illustrate the potential loss of budget flexibility that milestone budgeting might portend.

It seems clear that reduced flexibility is the most important concern among those persons considering any form of multiyear budgeting, including milestone budgeting. The degree of inflexibility can always be adjusted to tolerable levels, however, by reducing the number of weapons systems covered by milestone budgeting. Thus, careful management would have to balance the stability gains from milestone budgeting against the potential loss in flexibility in deciding the scope of the milestone approach.

BUDGET VARIABILITY

In the interest of achieving greater program stability, milestone budgeting could also introduce variability in defense budget authority. Budget variability is defined as year-to-year variations in the defense budget authority that could be introduced if the Congress were to grant approval in a single year for multiple years' funding for production of a major weapons system. Potentially large perturbations in funding could complicate the debate over the total defense budget, since that debate often revolves around the real growth of budget authority from one year to the next and growth rates could be skewed by milestone funding for several large systems at once. Large variations in a particular year could also adversely affect other, smaller programs subject to review in that year as their funding was cut in order to accommodate the budgetary demands of milestone programs.

Budget variability is probably not as important a problem as inflexibility. It would apply mainly to budget authority, since outlays from weapons programs depend on the pace of manufacturing rather than when money is appropriated. Moreover, increased variation in budget authority could be avoided by the management practices discussed below. Nonetheless, given the importance of real growth as a measure in the annual debate over the

defense budget, the possibility of increased budget variability cannot be ignored entirely.

Degree of Variability

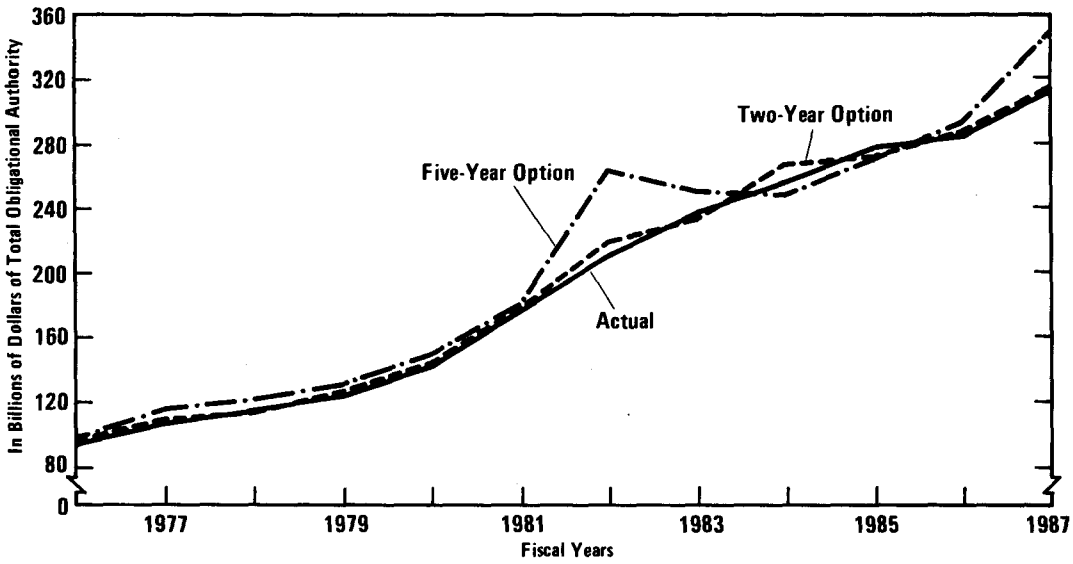
The degree of variability that milestone budgeting could introduce would depend on some of the factors previously discussed concerning budget flexibility: the number of programs subject to milestone budgeting and whether or not milestone funding was authorized, but not appropriated.

In addition, the potential to introduce variability would depend on the way in which the Congress approved funds for milestone programs. The Congress could avoid introducing budget variability if it approved in advance several years of annual funding for milestone programs. For example, the Congress could decide to provide a milestone budget for a large production program expected to cost $5 billion in budget authority over three years, but stipulate that only $1 billion could be available for obligation in the first year, $2 billion in the second, and $2 billion in the third. This approach should cause no budget variability compared with a budget based on the current annual budget process. By contrast, if the Congress were to provide funds in a lump-sum fashion--that is, all $5 billion approved in a single year to be obligated as production needs dictate--significant budget variability could result.

To assess this potential problem, CBO examined the same major programs considered above--the December 1985 SAR programs--under the same assumptions that were applied to the flexibility analysis. The following analysis, however, assumes that lump-sum funding for milestone budgeting was phased in beginning in 1976. The details of method and the milestone budgeting alternatives--two-year and five-year versions--are the same as those discussed regarding budget flexibility.

Figure 4 illustrates the changes in funding that would have occurred relative to actual budget levels during the 1976-1987 period in the total DoD budget. The five-year option would have introduced greater variance than the two-year version. The five-year option, for example, varied an average of 5.3 percent from the actual DoD budget from 1976 through 1986, while the two-year option varied by an average of 1.3 percent. The range of variation is also greater for the five-year option. The funding adjustments that would have been required to meet the two-year option would have varied from -2.2 percent from the actual funds appropriated in 1985 to +4.6 percent in 1984. Funding for the five-year option would have required an adjustment of -3.2 percent in 1984 to +25.4 percent in 1982.

Figure 4.
Total DoD Budget Variability Under Two Milestone Options



SOURCE: Department of Defense, *Selected Acquisition Reports* (December 1985).

The potential effects of lump-sum funding are less significant as a percent of the total DoD budget, since much of that budget--with more than half devoted to operating costs plus acquisition of nonmajor programs--is assumed to introduce more dramatic budget variability if viewed in the context of the R&D and production budgets separately. (See Appendix B for details.)

Clearly, given actual program behavior during the 1976-1987 period, lump-sum milestone budgeting for all SAR programs would have introduced significant budget variability compared with actual defense acquisition budgets. On the other hand, in order to minimize the potential for major fluctuations in total budget levels that could result from lump-sum funding, milestone budgeting options could be adopted that limited the number of milestone programs or minimized the period of lump-sum funding. Major fluctuations in the budget generated by milestone budgeting could also be minimized by effective strategic planning for acquiring weapon systems, based both on affordability and military priorities. A premium would be placed on determining mission area needs, establishing priorities among requirements, and achieving coordination among the armed services in these matters. Budget variability could also be minimized through the development and use of realistic program baselines and the effective management of proposals to change programs. Alternatively, the Congress could simply avoid the budget variability problem by eschewing the lump-sum approach.